Oscilloscope Transistor Tester

DSO-TC2



CATALOG

1、SAFETY INSTRUCTIONS

- Please read the manual carefully before use
- Do not use the instrument in a flammable and explosive environment
- Used batteries and discarded instruments replaced by instruments cannot be disposed of with household waste.Please handle in accordance with relevant national or local laws and regulations
- When there is any quality problem with the instrument or when there is a question about using the instrument,You can contact "Finiris-FNIRSI" online customer service or the manufacturer,We will solve it for you as soon as possible

2、PRODUCT INTRODUCTION

- This product ingeniously integrates digital oscilloscope, electronic component tester, PWM signal generator and other functions into one.Equipped with large-size color dot matrix TFT display.Built-in rechargeable lithium battery.Bring more practical functions to users with a small size,Also has good portability



【Mode Display】

- This instrument is especially suitable for fast pairing of transistors, identification of mixed surface mount and wordless components, and preliminary screening of small batch components
- "Mos Test" mode can test various types of transistors, and can identify device type, pin polarity, hFE, turn-on voltage, junction capacitance; can test capacitance, resistance, inductance components, etc
- This instrument is especially suitable for fast pairing of transistors, identification of mixed surface mount and wordless components, and preliminary screening of small batch components
- "Oscilloscope" mode to test the signal waveform of the circuit
- Support online operation with computer, you can refresh the official firmware by yourself and complete the upgrade

3、TECHNICAL PARAMETER

【3.1】FNIRSI DSO-TC2 Equipment Parameters

Display	2.4 inch TFT color screen, LED backlight
Powered by	1500mAh rechargeable lithium battery
Charging	USB Type-C, +5V
Size	L79*W31*H103mm
Bracket	Hidden Support frame

【3.2】Specifications Of Oscilloscope Mode

- The oscilloscope has a real-time sampling rate of 2.5MS/s and a 200kHz bandwidth
- With complete trigger function (Single, Normal, Automatic), it can be used freely for both periodic analog signals and aperiodic digital signals
- Up to ±400V voltage signal can be measured
- Equipped with efficient one-key AUTO, the measured waveform can be displayed without cumbersome adjustment
- Self-contained 80kHz /5.0V PWM wave test signal source with adjustable duty cycle

Real-time sample rate	2.5MS/s
Analog bandwidth	0～200kHz
Input resistance	1MΩ
Coupling	AC/DC
Test voltage range	1:1 probe: 80Vpp (±40V)
	10:1 probe: 800Vpp (±400V)
Vertical sensitivity	10mV/Div ～ 10V/Div (in 1-2-5 increments)
Vertical displacement	Adjustable, with indication
Horizontal time base range	10μs/Div ～ 500s/Div (in 1-2-5 increments)
Trigger mode	Automatic, Regular and Single

Trigger type	Rising edge, falling edge
Trigger level	Adjustable, with indication
Waveform freeze	Yes (HOLD function)
Automatic measurement	Maximum, minimum, average, rms, peak-to-peak, frequency, period, duty cycle
PWM output	FRQ: 0～80KHz, Duty cycle: 0～100%, Amplitude: 5.0V

【3.3】Technical Parameters Of Transistor Detector

- This instrument can automatically identify and measure various transistors.Including NPN and PNP transistors, N-channel and P-channel field effect transistors, junction field effect transistors, diodes, double diodes, thyristors, etc.,and passive components such as resistors, inductors, capacitors, etc
- Automatic detection of pin definitions
- It can automatically parse the infrared code of the NEC protocol
- Other functional modes: including circuit continuity test, 0~16V input voltage measurement, PWM output, 0~24V Zener diode measurement, DS18B20 temperature sensor measurement, DHT11 temperature and humidity sensor measurement, etc

Category	Scope	Technical Parameter
Triode	*	Magnification hfe, base-emitter voltage Ube, Ic/Ie, collector-emitter reverse cut-off current Iceo, Ices, protection diode forward voltage drop Uf ①
Diode	Forward voltage drop <5V	Forward Voltage Drop, Junction Capacitance,Reverse Leakage Current ②
Zener diode	0.01～4.5V	(1-2-3 test area) forward voltage drop, reverse breakdown voltage
	0.01～24V	(K-A-A test area) reverse breakdown voltage
FET③	JFET	Gate capacitance Cg, drain current Id at Vgs, protection diode forward voltage drop Uf ④
	IGBT	Drain current Id at Vgs, protection diode forward voltage drop Uf ④
	MOSFET	Turn-on voltage Vt, gate capacitance Cg, drain-source resistance Rds, protection diode forward voltage drop Uf ④

SCRS	Turn-on voltage <5V, gate trigger current <6mA	Gate voltage
Triac		
Capacitance	25pF～100mF	Capacitance value, loss factor Vloss ⑤
Resistance	0.01Ω～50MΩ	resistance
Inductance	10uH～1000uH	Inductance value, DC resistance ⑥
Battery	0.1～4.5V	Voltage value, positive and negative polarity
Input voltage	0～16V	Voltage value
DS18B20	*	Temperature
DHT1	*	Humidity
PWM output	1.5kHz～9.99MHz	*
Infrared remote control decoding	NEC protocol infrared code	Display user code and data code, and display the corresponding infrared waveform

Note ①: Ices, Iceo, Uf are displayed only when valid
Note ②: Junction capacitance and reverse leakage current are displayed only when valid
Note ③: The turn-on or turn-off voltage of the FET must be less than 5V
Note ④: Displayed only when there is a protection diode
Note ⑤: Vloss is only displayed when valid
Note ⑥: Two-pin component and inductance measurement when the resistance is less than 2.1kΩ

4、BUTTON & INTERFACE

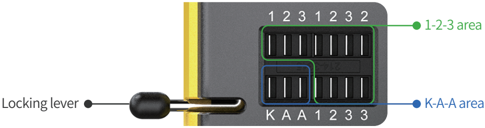
【4.1】Button Function



Button	Operate	Function Description	
		Digital Oscilloscope	Transistor Tester
⏻	Short Press	Test mode selection	
	Long Press	OFF	
MENU / AUTO	Short Press	Auto-adjustment rate below 20Hz cannot be calibrated correctly	Enter or exit the system
	Long Press	Enter the calibration confirmation interface - press the OK button to enter the calibration mode(long press AUTO again to cancel the calibration)	
↵ / OK	Short Press	Select the operation object	Confirm current operation
	Long Press	Fast-moving	
△	Short Press	Move up/change mode	Move/change mode
	Long Press	Move up continuously	
▽	Short Press	Move down/Change mode	
	Long Press	Move down continuously	
TEST / HOLD	Short Press	Pause/Start Waveform	Start a new measurement
	Long Press	In the vertical voltage gear position, long press to switch X1/X10. In other cases, long press to show/ close detailed parameters	

Note: In DSO oscilloscope mode, the parameters will be automatically saved if there is no key operation for 0.5 seconds

【4.2】Transistor Test Socket



【Ocking IC Seat】

- The locking IC seat is divided into 1-2-3 area and K-A-A area (as shown above)
- The locking IC seat has a total of 14 jacks.Each jack is marked 1, 2, 3, K, A.If the labels are the same, they are connected internally and have the same function

- There is a locking lever on the left end of the socket.The socket is relaxed when standing up.Insert or remove the component under test at this time.When turned down, the socket is locked and tested
- After inserting the element under test and locking.Press【TEST】button to test.The tester automatically identifies the pin name of the component and the test point where it is located, and displays it on the screen
- When testing 2-pin components, it can be inserted into any two holes with different labels in the 1-2-3 area.No need to distinguish
- When testing 3-pin components, it can be inserted into any three holes with different numbers in the 1-2-3 area.No need to distinguish
- The K-A-A jack is a special area for withstand voltage testing.There is about 30V DC high voltage inside.K is positive and A is negative. It is used for withstand voltage test and cannot be mixed.The positive electrode of the component under test, such as the Zener diode, is inserted into A, and the negative electrode is inserted into K

NOTE !

1. Discharge the capacitor before measuring the capacitor, otherwise it may burn the instrument
2. Live test is not recommended

【4.3】Signal Interface



【Signal Interface】

- There are 3 MCX coaxial sockets evenly distributed on the top surface, and their outer rings are connected to the same ground.The uses are:

【IN(0~16V)】——Test voltage input port, the core wire is positive, and the maximum measured voltage cannot exceed DC16V

【PWM】——PWM square wave signal output port, output square wave signal with adjustable pulse width

【DSO】——oscilloscope test signal input port, the maximum measurement voltage shall not exceed ±40V (probe X10 shall not exceed ±400V)

- For wired testing, you should use test wire with MCX plugs to connect to the instrument

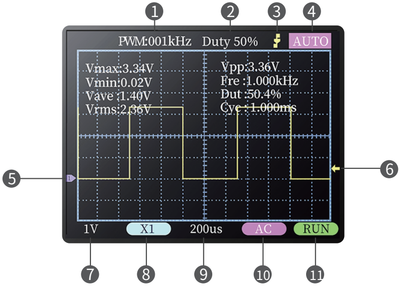
【4.4】Charging Interface

- The instrument is powered by a built-in lithium battery.There is a USB Type-C charging port on the bottom.Connect to 5V charger for charging
- The indicator light is solid red when charging, and the indicator light is solid green when fully charged

NOTE!	In order to avoid static electricity damage to the instrument or the component under test, do not use it while charging

5、OSCILLOSCOPE MODE FEATURES

【5.1】TFT Display



1. PWM square wave signal output frequency, the output range is adjustable from 1-80KHz
2. PWM square wave signal output duty cycle, the output range is 0-100% adjustable
3. Trigger edge indicator
4. Trigger mode indicator icon.Auto means automatic triggering.Single means a single trigger.Normal means normal trigger
5. Baseline indicator icon.This icon indicates the position that the current position is OV voltage
6. Trigger voltage indicator icon

⑦ Vertical sensitivity.Indicates the voltage represented by one grid in the vertical direction

⑧ 1X/10X mode indicator icon.This must be consistent with the 1X/10X switch setting on the probe handle.If the probe is in 1X gear, then the oscilloscope should also be set to 1X gear.1X measures ±40V voltage, 10X measures ±400V voltage

⑨ Horizontal time base.Indicates the length of time represented by one grid in the horizontal direction

⑩ Input coupling mode indicator icon.AC stands for AC coupling.DC stands for direct current coupling

⑪ Run pause indicator.RUN means run.STOP means pause

【5.2】Real-time Measurement Parameters

Long press the【TEST】button to display/hide the 8 real-time measurement parameters displayed in the upper part of the screen:

Vmax = Maximum voltage	Vpp = Peak-to-Peak Voltage
Vmin = Minimum voltage	Fre = Frequency
Vave = Average Voltage	Dut = Positive duty cycle
Vrms = RMS voltage	Cyc = Cycle

Note: When the waveform amplitude exceeds the screen,these measurements will produce large errors

【5.3】Oscilloscope Probe

- Insert the oscilloscope probe with the MCX plug into the top【DSO】jack.First adjust the attenuation file on the probe.Clip the probe's ground to the "reference ground" of the circuit under test
- The probe tip or hook is securely connected to the node under test in the circuit.Observe the voltage waveform of the measured point on the screen

NOTE!

1.The attenuation ratio of the probe should match the voltage of the signal under test.Please do not measure voltage signals that exceed the maximum range
2.When measuring the signal exceeding the safe voltage, the human body should not touch the exposed metal part of the instrument to avoid electric shock injury

6、TRANSISTOR TESTER MODE FEATURES

【6.1】Operation And TFT Display

- After entering this mode, the test will start automatically.Displays the internal Lithium battery voltage in the "Testing" state
- After the test results come out, you can click the【TEST】button to perform the next test at any time



【6.2】Zone 1-2-3 Test Seat

- Choose the right socketAfter inserting and locking the pins of the components under test such as transistors, resistors, capacitors, and inductors.Click【TEST】to start the test,After waiting for 1~3 seconds.Test results will be displayed on the screen

(1) Protection diodes inside bipolar transistors and MOSFETs can be detected

(2) Measure the current amplification factor (hFE) of bipolar transistors and the turn-on voltage (Uf) of the emitter junction.Darlington transistors can be identified by high threshold voltage and high current amplification factor

(3) The parameters Iceo, Ices and Uf of the measuring triode will only be displayed when the measurement is valid

(4) The diode's equivalent capacitance C and reverse leakage current Ir are displayed only when the measurement is valid

(5) The turn-on or turn-off voltage of the FET should be less than 5V.Other wise, the measured results are only its equivalent parameters (diodes, capacitors, etc.)

(6) The turn-on voltage of the thyristor should be less than 5V.In addition, the trigger current for maintaining conduction must be less than 6mA,other wise it cannot be measured correctly

(7) The vLoss displayed when measuring the capacitance means loss and attenuation. The larger the value, the worse the capacitance performance, and the closer it is to scrap. For capacitors below 20pF, the common method is to test a 20pF capacitor in parallel

(8) When the measurement range of the inductance is 10μH-1000uH, the inductance measurement should be performed when the resistance is less than 2.1kΩ.Air core coils and power inductors cannot directly measure inductance.It is recommended to connect a suitable color ring inductance test in series

(9) The output current of the test socket is 6MA.SCRs and Darlingtons that require larger current drive cannot be tested

(10) The LED is detected as a diode and the forward voltage drop is higher than normal.Double LEDs are detected as double diodes.At the same time, the LED will flash

【6.3】 Zone K-A-A Test Seat

- Insert the positive pole of the component under test, such as the Zener diode, into A, and the negative pole into K.After locking the socket, click【TEST】to start the test.The maximum range of the Zener tube that this instrument can measure is 24V.For details, please refer to the description of 【7、EXTENDED TESTING CAPABILITIES】

【6.4】Infrared Remote Control Decoding

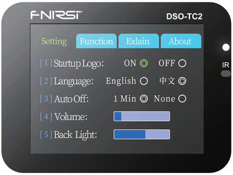
- While the tester is waiting to test.Aim the IR remote control at the "IR" mark on the panel of the tester.Press the remote control button.The instrument automatically starts to receive infrared signals and perform decoding processing.After the decoding is successful.the user code and data code will be displayed.And display the corresponding infrared waveform

- If decoding fails or cannot be decoded, the user code and data code are not displayed.At this time, if you are in the tester interface, you cannot enter the infrared decoding interface.If it is in the infrared decoding interface, the last successful decoding information will still be displayed

Note: This instrument only supports infrared code decoding of NEC protocol

【6.5】System Settings

- Press【MENU】button in TC2 component tester mode.It will enter the setting menu page, press the direction【Up】and【Down】buttons to select the tem.Press【OK】to adjust parameters or switch states
- The items that can be set are as follows:



【Set Display】

(1) Boot LOGO Off/On

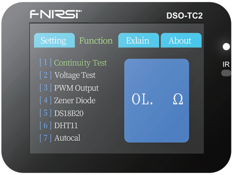
(2) System language English/Chinese

(3) No operation for 1 minute:
Auto Off / None

(4) Adjust system volume.

(5) Adjust screen backlight brightness

7、EXTENDED TESTING CAPABILITIES



【Function Display】

- After pressing the【MENU】button to enter the setting menu.Press【TEST】button again to enter the function page.Extended test items and calibration function items are provided here

(1) Continuity Test: Use the test sockets 1 and 2 of the test socket to carry out continuous resistance test.If the circuit is low resistance, it is judged as "on" and a buzzer sounds

(2) Voltage Test: The MCX test line needs to be inserted into the top jack【IN (0~16V)】to test the voltage between the test lines

(3) PWM Output: adjustable frequency and duty cycle, output from the top MCX jack【PWM】

(4) Zener Diode: Use the test seat K-A-A area for testing.See description in【6.3】

(5) DS18B20: Follow the on-screen instructions to insert the temperature sensor into the test seat and measure

(6) DHT11: Follow the on-screen prompts to insert the temperature and humidity sensor into the test seat to measure

(7) Autocal: Insert the three-pin short-circuit wire into the 1-2-3 jack of the test socket.Press【OK】button to select Start.Press【OK】button again to start calibration.During the calibration process, disconnect the short wire according to the prompt.When the progress bar reaches 100%,the calibration of the current mode of the instrument is completed. No further action required

NOTE!	External circuits must be powered down,Otherwise it will damage the device

8、FIRMWARE UPGRADE

- The instrument uses a USB analog U disk for firmware upgrade.The simulated U disk cannot be used to save or transfer other data.For firmware upgrade and charging only
- Firmware comes in a variety of file formats.Different operating steps need to be selected according to the situation
- The computer system required for the upgrade is Windows 10 or above

(1) CH UPGRADE (Digital Oscilloscope)

a. Use the Type-C data cable with D+ and D- to connect the instrument and the computer in the off state

b. Wait for about 2s after booting.Observe whether there is a U disk named "CH BOOT" on the computer.If it does not exist, repeat steps A and B

c. Copy the firmware file starting with CH into the U disk.After the upgrade is complete, you will see an upgrade prompt at the bottom of the screen: Update complated

NOTE：1.The firmware starting with the prefix "CHD" is the firmware of the DSO oscilloscope part.The firmware starting with the prefix "CHT" is the firmware of the TC2 transistor part
2.Only one firmware can be upgraded each time. If you need to upgrade multiple firmwares, you need to repeat steps A, B, and C.

(2) MM UPGRADE (Transistor Detector)

a. Use the Type-C data cable with D+ and D- to connect the meter and the computer in the off state

b. Press and hold the down arrow key, turn it on, wait for about 2s, and observe whether there is a U disk named "MM BOOT" on the computer (at the same time, the lower left corner of the screen displays: MM Boot), if not, repeat steps A and B

c. Copy the firmware file starting with MM into the U disk to complete the upgrade

NOTE: After the upgrade is complete, the system will automatically restart.If you do not need to upgrade, you can short press the power button to reset the system or long press the power button to shut down

9、COMMON PROBLEM

1: How to judge whether the battery is fully charged?

A:When the battery is fully charged, the charging indicator will change from red to green

2: Why does the tested waveform keep shaking left and right and cannot be fixed?

A:The trigger voltage needs to be adjusted, that is, the yellow arrow on the right.In trigger mode, press the up and down keys to adjust the trigger voltage. After adjusting the yellow pointer between the upper and lower part of the waveform, the waveform can be triggered and fixed

3: Why is there no waveform when measuring a battery or other DC voltage?

A: The battery voltage signal is a stable DC signal, and there is no curve waveform.When adjusting the vertical sensitivity in DC coupling mode, there will be an upward or downward offset line waveform.If it is AC coupled, there is no waveform no matter how you adjust it

4: Why is the measured mains 220V waveform not a very standard sine wave, with distortion?

A: The mains power grid is generally polluted and contains more high-order harmonic components.The superposition of these harmonics on the sine wave will show a distorted sine, which is a normal phenomenon. Generally,the mains waveform is distorted and has nothing to do with the oscilloscope itself

5: Why is there no signal input,The baseline (OV) on the screen and the arrow on the left (OV indicated) are not the same, there is a relatively large offset?

A: Please unplug the probe and USB cable.Press【AUTO】button to enter the calibration confirmation interface,Then click the【OK】button to enter the automatic calibration

6: Why do the results obtained by measuring MOSFET and IGBT are diodes, capacitors and other parameters?

A: Because the turn-on or turn-off voltage of the MOSFET or IGBT is greater than 5V (the maximum supply voltage of the chip)As a result, the MOSFET or IGBT cannot be turned on or off normally.Therefore, only its equivalent parameters can be measured

10、NOTE

1. After receiving the device, please use it after it is fully charged
2. When measuring high voltage, it is forbidden to touch any metal part of the oscilloscope to avoid the risk of electric shock
3. It is forbidden to use it while charging the device
4. Do not place the machine in a place that is unstable or may be subject to strong vibrations
5. Do not place the machine in places with high humidity, dust, direct sunlight, outdoors or near heat sources
6. USB firmware upgrade only supports WIN10 and above.Drag in files other than release firmware is prohibited.May cause irreversible consequences
7. The instrument is powered by a built-in 3.7V rechargeable lithium battery, which can be used for a long time.Please use the power adapter to extend battery life
8. When not in use for a long time, the battery should be discharged to 3.7V before storage
9. When using the oscilloscope mode, pay attention to the selection of the gear. The gear of the oscilloscope should be consistent with the gear of the probe.
10. When calibrating,The BNC probe needs to be unplugged, or the positive and negative poles of the probe are short-circuited

11、PRODUCTION INFORMATION

Product name: Oscilloscope Transistor Tester

Brand / Model: FNIRSI / DSO-TC2

Manufacturer: Shenzhen FNIRSI Technology Co., Ltd.

Website: www.fnirsi.cn

Address: Building C, Weihuada Industrial Park, Dalang Street, Longhua District, Shenzhen, Guangdong, China

www.fnirsi.cn